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Dry Meadow Restoration Project

Draft Environmental Assessment

Western Divide Ranger District, Sequoia National Forest
Tulare County, CA



Dry Meadow, Sequoia National Forest

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Common Abbreviations

APE	Area of Potential Effects
BA	Biological Assessment
BE	Biological Evaluation
BMP(s)	Best Management Practice(s)
CNDDDB	California Native Diversity Data Base
CSUS	California State University, Sacramento
CWE	Cumulative Watershed Effects
ERA	Equivalent Roaded Acres
LOP	Limited Operating Period
MIS	Management Indicator Species
NFS	National Forest System
ROD	Record of Decision
SNFPA	Sierra Nevada Forest Plan Amendment
SQF	Sequoia National Forest
TES	Threatened and Endangered Species
TOC	Threshold of Concern
USFWS or Service	United States Fish and Wildlife Service
GSNM	Giant Sequoia National Monument

Background

Dry Meadow is located eight miles northwest of Kernville, California (see Figure 1). The project encompasses a 55-acre complex of meadows in the headwaters of Bull Run Creek, tributary to the North Fork Kern River above Isabella Lake in Township 24 South, Range 32 East, Section 33, Mount Diablo Base and Meridian.

Dry Meadow is delineated into two distinct morphological reaches. The two principal forks have small drainage basins. The Tobias Fork is 1.11 square miles and the Baker Fork is 1.40 square miles. The upper narrow reach along the headwaters of the Tobias Creek Fork is distinguished by small pocket meadows separated by steep gradient constrictions. The Baker Fork reach is relatively wider, with a flatter gradient. The meadow is in a degraded condition, primarily due to the excavation of drainage ditches, and legacy roads disrupting the hydrology of the meadow. Current uses of the meadow include cattle grazing and occasional recreation,

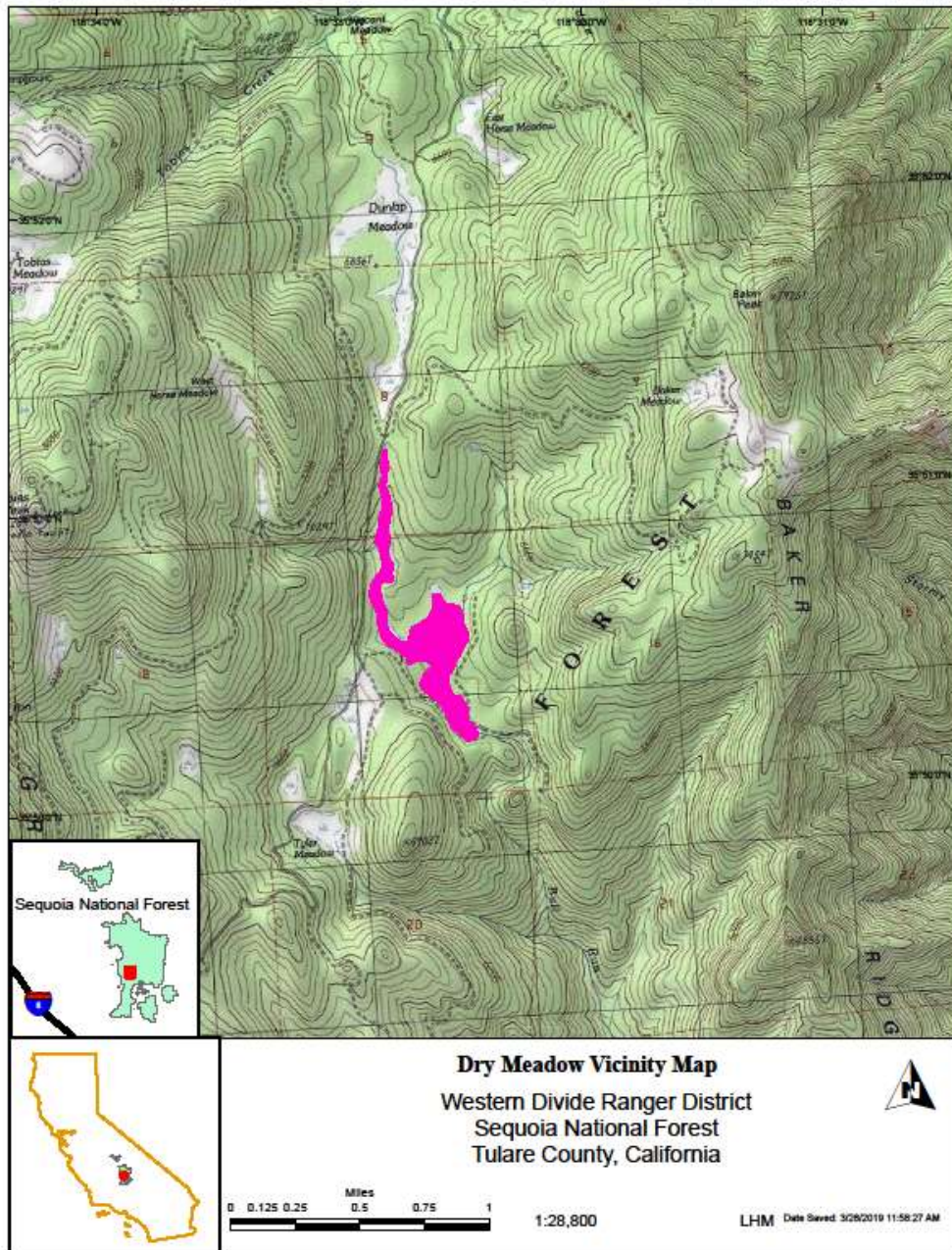


Figure 1. Project vicinity map.

Need for the Proposal

The purpose of this project is to restore the physical and biological functions of the meadow by improving hydrologic connectivity and processes in the meadow complex which would allow flood flows to access the meadow floodplain. This meadow was evaluated and identified as a priority, as part of the watershed improvement needs inventory. The combination of historic sawmill infrastructure (drainage ditching and roads), contemporary roads, legacy livestock over-grazing, and fires, likely initiated the systemic incision of multiple channels present today. In its existing condition, flood flows do not access the floodplain, but are contained within the multiple incised channels.

The channel degradation process is ongoing, as evidenced by active head cuts present in many of the gullied channel incisions in the meadow. The primary head cut eroded 10 feet during the winter of 2016. Erosion of the main Dry Meadow reach has removed approximately 52,850 cubic yards of soil, thus contributing to the degradation of downstream habitats. Average depth of the main gully channel is six feet below the historic floodplain, and averages 64 feet in width. The average width of the historic floodplain is 155 feet. To achieve full floodplain function requires either filling the incised channels or installing other structures to disperse flood flows onto the floodplain.

The restoration of ecological function and resilience would reduce landscape vulnerability to potentially negative effects of climate, natural disasters, or other disturbances. Specifically, functional hydrologic processes in Dry Meadow would provide the following ecosystem benefits:

- 1) Increased aerial extent of wet/moist meadow habitat
- 2) Reduce peak flood flows and increase/extend summer base flows
- 3) Increased extent of in-stream cover and shading
- 4) Improved aquatic and terrestrial habitat quality
- 5) Improved water quality (decreased water temperature and sedimentation)
- 6) Raising the groundwater level within the meadow complex
- 7) Reduced soil erosion from headcutting and gully wall erosion
- 8) Improve infiltration of precipitation
- 9) Increased vegetative productivity

Forest Plan Direction

The Forest Service completed the original Sequoia National Forest Land and Resource Management Plan (Forest Plan) in 1988. All proposed actions to restore the hydrologic function and/or floodplain connectivity are necessary to meet the desired conditions as set forth in the 1988 Forest Plan Direction, as amended by the Sierra Nevada Forest Plan Amendment ROD (SNFPA USDA, 2004), and is consistent with the Mediated Settlement Agreement (SQF MSA, 1990). Guidance includes:

- SQF-LRMP B1 (p.4-3): Maintain or improve long term soil productivity.
- SQF-LRMP B4 (p.4-4): Emphasize protection management and improvement of riparian areas during the planning and implementation of land and resource management activities along stream courses on the forest.
- SQF-LRMP C3n3 (p. 4-9): Meadows will be managed to a fair and better condition and to maintain their existing acreage and restore any that have been damaged. Trails will be rerouted away from meadows where unacceptable damage is occurring. On the meadow edge, large tree character and a diverse environment of structural “edge” effects will be provided.
- SQF-MSA Exhibit D (p.9): “...Plans will be developed from prioritized WINI inventories to reestablish hydrologic characteristics and riparian habitat...”
- SNFPA RCO#2-105 (p.64): At either the landscape or project scale, determine if the age class, structural diversity, composition and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.
- SNFPA RCO#6-122 (p.66): Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered ground water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices, for example, road building, recreational use, grazing, and timber harvests that may be contributing to the observed degradation.

Decision to be Made

The Forest Supervisor will decide whether to implement the proposed action, an alternative to the proposed action, or to take no action at all.

Public Involvement the Dry Meadow Restoration Project was first listed in the Sequoia National Forest Schedule of Proposed Actions (SOPA) on October 1, 2017. The SOPA is available on the internet at: <https://www.fs.fed.us/sopa/components/reports/sopa-110513-2017-10.html> as well as being distributed by the Forest Service to interested parties. A scoping letter and description of the proposed action was sent to interested parties on July 12, 2017, with comments requested by August 12, 2017. One interested party submitted written comments that addressed proposed restoration design methods, future grazing use and livestock fencing, preparation of an EA, and permitting. The comments were used to help shape the design of the project, and the analysis in this document. A summary of all scoping comments received is available in the project file.

Issues

In response to comments received during the scoping period, the project Interdisciplinary Team (IDT) developed issues and separated them into two groups: substantial and unsubstantial issues. Substantial issues are those directly or indirectly caused by implementing the proposed action. Unsubstantial issues are those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher-level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. A list and summary of all scoping comments, including unsubstantial issues and reasons regarding their categorization as unsubstantial, can be found in the project record. Based on the scoping comments received, the IDT identified the following substantial issues:

Issue 1. Meadow Restoration Design

- 1) The goal should be to restore sheet flow to the meadow, similar to conditions before degradation.*
- 2) Pond-and-plug should not be a permanent solution. Eventually, the ponds should be filled, and the plugs should support wetland vegetation.*
- 3) Remove cattle from the meadow.*
- 4) Prepare an Environmental Assessment.*

In summary, the primary relevant issue is the concern with the creation of ponds adjacent within the meadow floodplain. Alternatives to eliminating floodplain borrow sites is preferred, with the end-goal to restore sheet flow to each meadow similar to what existed prior to grazing and other human-induced impacts that channelized the meadows. Any design using the pond and plug method that creates ponds in the meadow floodplain should include a plan and design criteria to eventually fill the ponds, either naturally or through some other low impact infill method. Plugs should also be designed to support wetland vegetation, and not upland vegetation. This may require a future entry into each meadow, by design, to eventually restore the entire meadow to its original grade and

sheet-flow function. Any future entry should be incorporated into the proposed design of the project.

The issues were used to analyze environmental effects, with indicator measures given to compare the effects of the proposed action and no action alternatives.

Issue 2. Categorical Exclusion Inappropriate for this site. Environmental Assessment should be produced due to complexity of site.

Proposed Action and Alternatives

Proposed Action Development

The goal of the meadow restoration is to improve the hydrologic connectivity and processes in the meadow complex in order to restore the physical and biological functions of the meadow, including flood flow access to the meadow floodplain, and restoration of the pre-degradational drainage regime, which included sheetflow. Given the goal of the project and the severity of the channel incision (gullies), restoration alternatives are limited. The Proposed Action uses a combination of on-site cut and fill materials (pond and plug technique, including terrace borrow sites) and riffle augmentation (using imported rock) to eliminate the abnormal drainage effect of the deeply-incised gullies. Meadow restoration techniques continue to evolve and the design for each project area is site-specific. Some restoration techniques, such as sediment trapping structures of wood, rock or other materials is unlikely to achieve the goal in Dry Meadow in any reasonable planning horizon given the limited sediment supply. During the development of the Proposed Action, borrow sources outside of the meadow floodplain were considered, and used to the greatest extent possible, while considering other resource constraints. Ponded water areas were kept to a minimum, as much as possible. However, the proposed borrow sites that would fill with ponded water were designed to have the least ecologically negative, and the greatest positive, impact possible. Plug elevations were also designed to balance the needs of first year protection from erosion with the need for erosion-control vegetation for long term stability with native and ecologically appropriate species. The Proposed Action was specifically developed to restore functional dynamic processes and preclude the need for additional entries and disturbance into the site. Additional entries into the site are unwanted due to the disturbance to vegetation that accompanies entry. Established vegetation plays a key role in channel/floodplain stability, and every effort is made to support the re-establishment of native vegetation to promote stability. It should also be noted that a return to the pre-degradational state is not likely to be able to support the use of heavy

equipment for a future entry, because it would be too soft and wet. The following Proposed Action and No Action alternatives were considered:

Proposed Action (Alternative 1)

Drainage through the meadow would be restored to the elevation of the meadow floodplain. The restored drainage base elevation would be anchored with a valley grade structure at a bedrock constriction just upstream of the 8.5-foot diameter culvert crossing for Forest Road No. 24S80. The design would eliminate the seven active headcuts on the mainstem, tributary, and remnant channels in the meadow. All restoration design features proposed in this alternative are presented in a Plan View Map shown in Figure 2.

The principal function of the borrow sites is to provide native fill material for gully plug construction. Borrow sites that are located within the floodplain and adjacent to the gully typically fill with groundwater, at least on a seasonal basis. Because of the existing intermittent nature of stream flows within Dry Meadow, it is difficult to predict whether or not the floodplain borrow sites would maintain perennially ponded water or would seasonally dry out. In any case, water levels within the floodplain borrow sites reflect the rise and fall of the groundwater elevation. Within the borrow sites, habitat features, and diversity are incorporated into the construction. These can include varying water depths, islands, peninsulas, basking logs, etc., which are determined as fill needs are met. Topsoil is removed and stockpiled adjacent to the plug fill zone for final top dressing of the completed plugs.

All plugs and borrow sites are sited and configured to accommodate natural meadow and hillslope surface and subsurface through-flow. To reduce the risk of cutting through the plug during infrequent flood events, the elevation, distance, and plantings between plugs is designed to carry high flows. The downstream edges of the plugs will be planted with sedge mats recovered from the gully bottom prior to plug construction.

Plugs are constructed with a wheel loader to provide wheel compaction of the fill. The compaction levels are intended to match the porosity/transmissivity of the native meadow soils. This allows moisture to move freely within the plug soil profile and support erosion resistant meadow vegetation for long term durability, as well as preventing preferential pathways for subsurface flows either in the plug or the native material. Figures 3a. and 3b. display schematic details of gully plugs and adjacent borrow sites with seasonally ponded water.

Upon completion, plug surfaces are ripped to a depth of 12 inches (to facilitate rainfall infiltration). The stockpiled topsoil is spread and then seeded with native seed, and

mulched. All native vegetation recovered from the fill and borrow sites is transplanted to plug edges, surfaces, and key locations on the remnant channel.

Once the project is completed, a temporary fence will be installed around the restoration site. This measure would exclude livestock from impacting the restoration site. The fence would remain in place for two to three years, or until stabilizing vegetation becomes established. Fence installation would present only small localized disturbance to the area where posts are installed. There is no erosion potential associated with installing a temporary fence. The fence would be aligned so that cattle trailing would not be encouraged in sensitive areas. Grazing impacts to the newly restored meadow would be monitored. Where necessary to protect re-vegetation and sensitive areas, grazing management options would be considered by the Forest Service, in consultation with the permittee. Options may include a change in numbers or the season of use, longer-term fencing, off-site watering, or mineral supplement placement.

Alternative 1 would include hand-thinning of conifers (less than 10 inches in diameter) along meadow margins in designated upland areas on Dry Meadow including all its feeder areas. Thinning will be done using hand tools or chainsaws. Riparian associates will be retained, and conifers will be targeted if they are 10 inches or less. No vehicles will be allowed in these areas to minimize ground disturbance. The design criteria and the use of hand tools or occasionally chainsaws should minimize ground disturbance so that sensitive plants, salamanders, and archeological or historic features are not disturbed.

Restoration of Meadow only (Alternative 2)

Drainage through the meadow would be restored to the elevation of the meadow floodplain. The restored drainage base elevation would be anchored with a valley grade structure at a bedrock constriction just upstream of the 8.5-foot diameter culvert crossing for Forest Road No. 24S80. The design would eliminate the seven active headcuts on the mainstem, tributary, and remnant channels in the meadow. All restoration design features proposed in this alternative are presented in a Plan View Map shown in Figure 2.

No Action (Alternative 3)

Under Alternative 3 (No Action), current management plans would continue to guide management of Dry Meadow. No erosion control or changes in grazing management would be implemented to accomplish project goals. Continued erosion, conversion to dry meadow habitat, and loss of ecological meadow functions would persist. Dry Meadow is in an active degradational trend. Evidence of the active degradation includes active head-cutting, channel down-cutting, soil erosion, diminished vegetative productivity, and low fish and wildlife population numbers. The streambed elevation and associated water

Figure 2. Project area with all proposed design features. Three potential access routes are proposed into the project area boundary.

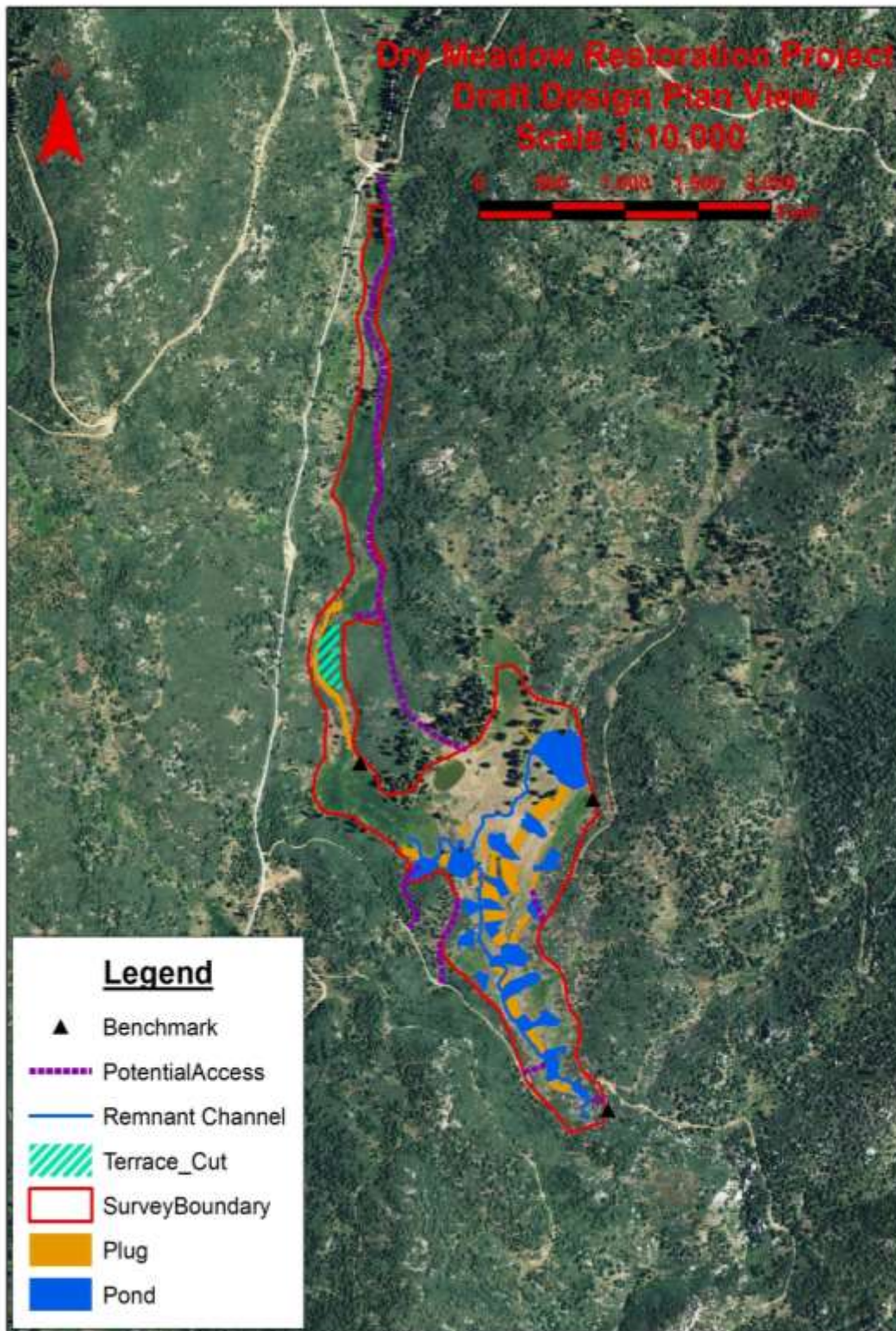


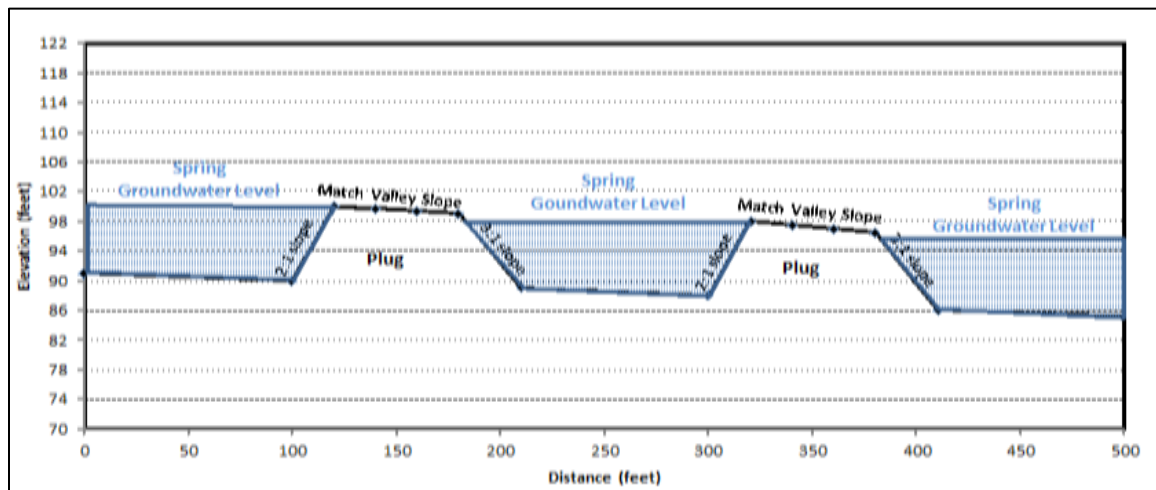
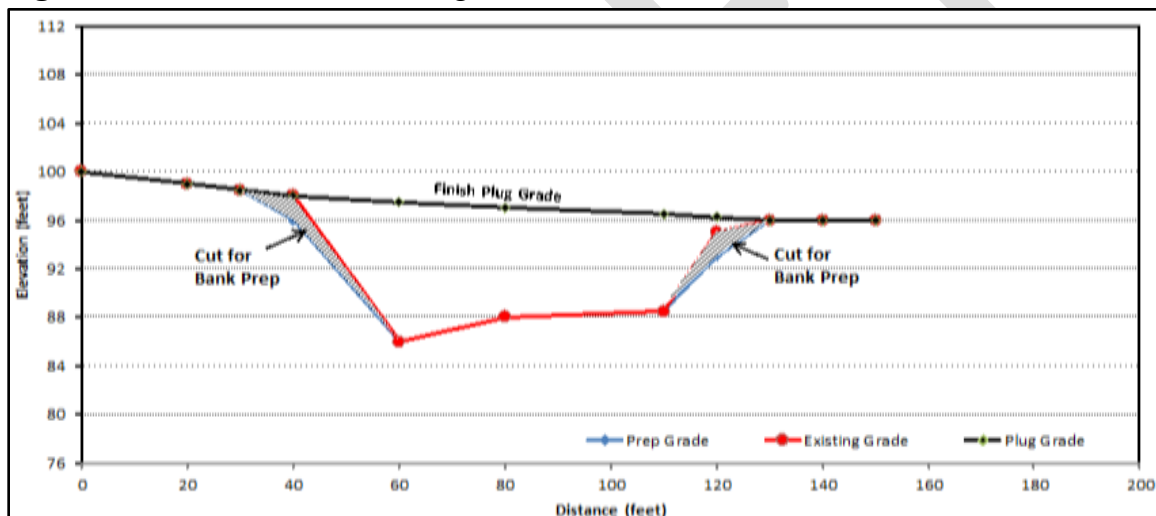
Figure 3a. Profile View Plug Schematic**Figure 3b. Cross-section View Plug Schematic**

table in Dry Meadow averages 6 feet below the historic floodplain and is currently draining the meadow of groundwater.

The current dysfunctional processes in this meadow are developing a self-reinforcing feedback cycle. As drainage channels within the meadow increase in size, they capture more and more of the flow that would otherwise move across the floodplain. The resultant erosional forces within these concentrated flow paths then erode more soil, and the flow path further increases in size in a vicious circle. As the meadow dries out from incised channels, dry plant communities are favored over moist plant communities. Of all meadow plant communities, moisture-loving sedges have the strongest, and most dense, roots that hold soil in place. Drier sites tend to favor bunch grasses or annual

grasses and forbs that are not as resistant to erosion. The loss of sedges is another feedback loop that accelerates soil erosion and the degradational trend. Current conditions favor the expansion of dry plant communities, including lodgepole and sagebrush in some areas. Under Alternative 2, it is expected that the acreage of dry plant communities would increase, and channels would continue to erode and incise, with further loss of fish and wildlife habitat.

Design Criteria

The interdisciplinary team identified the following design criteria management requirements to be implemented under the Proposed Action. They are designed to minimize the environmental effects of the Action Alternative and are listed below according to resource type.

Air Quality

There is a potential for the generation of excessive dust during construction. A water truck would be on-site during construction to minimize dust, water roads during the transport of imported materials, and protect against fire. Once the project is completed, there would be no air quality issues.

Aquatic Biota

Aquatic habitat through the project area is comprised of 0.8 acres of perennial stream channel, 0.64 acres of a perennial mill pond, and 0.82 acres of intermittent stream channel. Expected perennial flow during construction is about 0.1 cfs. When construction occurs in a live stream channel, the flow would be managed with construction of the first (top) gully plug. The first plug would effectively dry the channel out for subsequent plug construction. Flow would commence filling the floodplain aquifer. Prior to construction of the first plug in perennial flow, the channel would be surveyed for aquatic life. Aquatic organisms would be moved into the perennial water above the plug. In the existing condition, the 8.5-foot diameter culvert at the Forest Road No. 24S80 crossing is a partial barrier to fish passage into the meadow. No fish have been observed at the lower end of the meadow over the last 5 years.

We will survey for mountain yellow-legged frogs one week prior to construction.

A limited operating period will be established outside of spring time when frogs and tadpoles may be present in the system. Construction will occur under hot and dry conditions when the likelihood of migrating frogs is low. If significant rain occurs during construction; steps will be taken to control erosion and temporarily shut down operations.

For water trucks that are used during construction, the following Best Management Practices would be employed:

1. To prevent dewatering of aquatic habitat, all natural water bodies used for drafting for project activities must be reviewed by the Hydrologist or Forest Aquatic Biologist prior to use.
2. During water drafting for project activities, a screening device will be used to reduce pump intake velocity to minimize the removal of aquatic organisms. A drafting box that is two feet on each side and covered with ¼ inch screening is preferred.

Botany

There are no known occurrences of sensitive or local interest plants in the Dry Meadow project area. If a sensitive plant is found, mitigations specific to Forest Service Sensitive Species and Species of Local Interest include:

Sensitive Plants

1. Flag and avoid occurrences of Sensitive Plants, except as described below.
2. Any new occurrences of Sensitive Plants discovered in the project area will be evaluated for possible effects from project activities and protective measures will be implemented to prevent loss of these new occurrences.
3. Foot traffic by contractors, forest workers or work inspectors will be avoided within and through occurrences of Sensitive Plants.
4. Monitoring should take place during project activities and directly after project activities are completed in the vicinity of Sensitive Plants to ensure that protective measures are sufficient. This monitoring can be conducted by the Forest Service project inspector concurrently with project inspections. Any occurrences or suitable habitat areas which are impacted other than as allowed in the management requirements shall be reported immediately to the District Botanist or Forest Service representative.
5. Monitoring of impacted Sensitive Plant occurrences should take place periodically to determine whether impacts will have lasting adverse effects and whether the occurrences are still extant (have not been extirpated).

Botanical Interest Species

Flag and avoid occurrences of any botanical interest species located within the project area.

Noxious Weeds and Non-Native, Invasive Pest Plants

The following mitigations and best management practices will be implemented to prevent the introduction and spread of noxious weeds into the project area:

1. All equipment will be washed and inspected for noxious weeds prior to arrival at project area. For all heavy equipment, implement the equipment cleaning requirements in the standard contract provisions.
2. Any noxious weed occurrences found during project layout or implementation will be reported to the Forest Botanist.
3. For all activities: all construction equipment, clothing, particularly footwear, and other equipment, including the transport vehicle should be free of soil, mud (wet or dried), seeds, vegetative matter or other debris that could contain seeds in order to prevent new infestations of noxious weeds in the project area. Dust or very light dirt, which would not contain weed seed, is not a concern.
4. Where possible, manually treat dense infestations of bull thistle, woolly mullein or other weeds in material borrow areas prior to use to prevent spread, if flowers or seeds are present on the plants. In the three years following restoration, monitor for noxious weeds and manually treat dense infestations of bull thistle and woolly mullein. Manual treatment would entail hand pulling, digging, cutting and bagging of flower heads, or heating plants by magnifying sunlight (Solarization) with clear plastic. Solarization could be used in years following initial restoration.
5. Only certified weed-free erosion control materials will be used, and only to the minimum extent needed to stabilize bare soil. When needed for soil stabilization, favor use of on-site weed-free mulches or seeds, when available (i.e. leaf litter, chipped wood, hand-collected seed) over commercial certified weed-free mulches and seeds. Seed mixes must conform to the Region 5 Policy on the Use of Native Plant Material in Restoration or Revegetation Projects.
6. Rock and soil materials shall be obtained from weed-free sources. Do not stockpile or stage these or other construction materials in sites with noxious weeds.
7. Monitor the project area through time for noxious weeds to determine if existing weeds are being spread, or if weeds were accidentally introduced by project activities. Hand remove any small, newly discovered infestations of high priority weeds. Assess the need for a long-term eradication strategy, if needed.
8. Ensure that project personnel know how to identify the noxious weed species that may occur in the area. Any noxious weed occurrences found during any stage of project planning or implementation shall be reported to the Forest Botanist.
- Monitoring of recovery of native vegetation, and reduction of bare areas will be used to determine the seasonal timing and length of annual livestock use of the meadows to protect soils, stream banks, swales and native vegetation, including willows where appropriate.

Cultural Resources

1. All cultural resources are to be flagged and avoided. Avoidance should be accompanied by restricting access to the site areas through the installation of bright exclusionary fencing, and periodic spot monitoring by a qualified archaeologist.
2. Actions allowed within cultural resource boundaries include installing non-dig barriers (e.g., rock, log); blocking routes with woody debris; and, signing (e.g. closed, restoration activity information).
3. All heavy equipment is prohibited within cultural resource area boundaries.
4. Any type of excavation is prohibited within cultural resource area boundaries.
5. Monitoring of vegetation removal by a cultural resource specialist is required when working within, or adjacent to, cultural resource area boundaries.
6. Consultation with and review from a cultural resource specialist is required prior to implementation of any activity within or adjacent to a cultural site boundary.
7. Should previously undocumented cultural resources be encountered during any project activities in the APE, all ground disturbing activities in the vicinity of the find must be halted until a SQF archaeologist is informed of the discovery and treatment and management procedures are in place. These measures may include, but not necessarily be limited to, no action, on-site documentation, avoidance, subsurface test excavations, and data recovery. In the event that human remains, or any associated funerary artifacts are discovered during project activities, all work must cease within the immediate vicinity of the discovery and the SQF archaeologist immediately notified. The remains must be treated in accordance with the Native American Graves Protection and Repatriation Act.

Fire Risk & Fuel Spill Prevention

The meadow site and access roads are expected to be dry during implementation. There is a risk for wildfire associated with the use of any internal combustion engine, and heavy equipment. A trash pump and/or water truck would be on site to assist with vegetation transplants and dust control, as well as to reduce the risk of wildfire. In addition, equipment would be re-fueled and serviced at designated staging areas, outside of the riparian areas and meadows. No fuel would be stored on-site. In the event of an accidental spill, hazmat materials for quick on-site clean-up would be kept at the project sites during all construction activities, and in each piece of equipment. A water truck would be present and actively watering during any rock deliveries that may cause a spark.

Hydrology

The Kern River is an important water supply watershed for the Central Valley of California. Management requirements are designed to protect water quality and watershed conditions and are derived from Water Quality Management for Forest System

Lands in California, Best Management Practices (BMPs) (USDA 2011a) and Riparian Conservation Objectives (RCOs) (USDA 2004). Riparian resources within Riparian Conservation Areas (RCAs) and Critical Aquatic Refuges (CAR) will be protected through compliance with the Riparian Conservation Objectives Standards and Guidelines outlined in the Forest Plan (USDA 1988), as amended.

Construction activities would occur during the time of year when the stream channel flow is the lowest. This typically occurs between August 1 and October 30. Travel routes in the meadow would be minimized. Existing vegetation would be removed, stockpiled, and re-planted. Required permits would be obtained including the Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers, and the Clean Water Act Section 401 Permit from the Central Valley Regional Water Quality Control Board. Construction would be supervised on-site by at least one person with previous meadow restoration construction experience. Project construction may require further consultation with a Forest Service hydrologist and/or soil scientist prior to, or during, project implementation for interpretation, clarification, or adjustment of watershed management requirements.

Beneficial uses of water are protected by BMPs which prevent or minimize the threat of discharge of pollutants of concern, and address watershed management concerns. These management requirements and BMPs have been used on similar projects in the past and have been found to be effective in protecting water quality and watershed condition. Most are Best Management Practices (BMPs) from the Forest Service Region 5 publication *Water Quality Management Handbook* (WQMH) (USDA 2011). All applicable water quality BMPs shall be implemented. The implementation phase of the BMPs occur during and after a project is completed, but before the winter season. BMP monitoring of the project is done one year later after the project has experienced one rainy season.

The following hydrology BMPs would be implemented and are tailored to meet site specific needs to prevent impacts to water quality during implementation:

- **BMP 1.18 Meadow Protection**– The objective of this BMP is to avoid damage to ground cover, soil, and the hydrologic function of meadows. This project proposes to restore the hydrologic function of this meadow.
- **BMP 2.11 Equipment Refueling and Servicing**: This BMP prevents pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels. Servicing and refueling activities will be located a minimum of 100 feet away from the meadow edge. Site specific staging locations for

- equipment fueling will be identified prior to equipment mobilization to the site. A non-porous mat or equivalent would be used for the refueling.
- **BMP 2.13 Erosion Control Plan** - The Erosion Control Plan for this project is in Appendix A of the Dry Meadow Hydrology Report. Additionally, requirements of this BMP are met through 1) the design features for hydrology and soil resources that are in the Proposed Action, 2) the erosion control measures and monitoring that will be required by the 404 permit (U.S. Army Corps of Engineers) and 401 Permit (State Water Quality Control Board), and 3) other applicable BMPs as listed in this section.
 - **BMP 2.4 Road Maintenance and Operations:** This BMP ensures water-quality protection by providing adequate and appropriate maintenance and by controlling road use and operations. BMP 2.4 would be accomplished through the implementation of measures outlined in the Erosion Control Plan, regular road maintenance, and planning for emergency interim erosion controls along the roads utilized for project implementation. Temporary project access routes would be maintained to dissipate intercepted water in a uniform manner by installing rolling dips if needed. Only authorized personnel will be allowed use of these roads during implementation. Once the project is complete, access roads would be permanently closed and topographically restored to reduce the potential for erosion and concentrated runoff.
 - **BMP 2.5 Water Source Development and Utilization:** The objective of this BMP is to protect and maintain water quality during dust abatement and other management activities requiring the use of water. Dust abatement may be necessary on access routes to project sites or disturbed bare soil areas in each meadow. Additionally, water will be needed to assist in construction of structures, and possibly, to preserve stockpiled vegetation. Only approved drafting sites designated by the District Hydrologist and approved by the Forest Biologist would be utilized.
 - **BMP 2.8 Stream Crossings** – This BMP minimizes water, aquatic and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings. Erosion control measures and monitoring that will be required by the 404 permit (U.S. Army Corps of Engineers) and 401 Permit (State Water Quality Control Board) will minimize sediment production and water/aquatic/riparian disturbances when working in temporary or permanent stream crossings.
 - **BMP 2.11 Equipment Refueling and Servicing** - This BMP prevents pollutants such as fuels, lubricants, bitumens and other harmful materials from being discharged into or near rivers, streams and impoundments, or into natural or man-made channels. Servicing and refueling activities would be located a minimum of 100 feet away from the meadow edge. Site specific locations for equipment

- fueling would be identified prior to or during project implementation. A non-porous mat or equivalent would be used for the refueling at the staging area.
- **BMP 2.13 Erosion Control Plan** - The requirements of this BMP are met through: 1) the Design Features for hydrology and soil resources in the proposed action, 2) the erosion control measures and monitoring that will be contained in the 404 permit (U.S. Army Corps of Engineers) and 401 Permit (State Water Quality Control Board, and 3) other applicable BMP's in the 2011 WQMH as listed in this section.
 - **BMP 5.3 Tractor Operation Limitation in Wetlands & Meadows** – The objective of this BMP is to limit turbidity and sediment production resulting from compaction, rutting, run-off concentration, and subsequent erosion by excluding the use of mechanical equipment in wetlands and meadows except for the purpose of restoring wetland meadow and meadow function. All use of heavy equipment in meadow sites within this project are for the purpose of restoring the ecological and hydrological function of the meadow. Additional measures to minimize compaction and rutting include limiting travel corridors, using tracked equipment to displace the weight, and implementing the project under the driest soil conditions.
 - **BMP 7.1 Watershed Restoration:** The objective of this BMP is to repair degraded watershed conditions and improve water quality and soil stability. Restoration measures described herein reflect state-of-the-art techniques and have been chosen to custom fit the unique hydrologic, physical, biological and climatic characteristics of the meadow. The proposed design would contribute to improving watershed hydrologic functions.
 - **BMP 7.4 Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan:** The objective of this BMP is to prevent contamination of waters from accidental spills. BMP 7.4 will be implemented when total oil product at a site exceeds 1,320 gallons or any single container exceeds 660 gallons. The Forest Service has an SPCC spill plan designed to guide the emergency response to spills during construction. The SPCC has information regarding pollutants that would be used on this project such as diesel fuel and hydraulic fluid and their spill plan.
- BMP 7.6 Water Quality Monitoring:** The objective of this BMP is to collect representative water quality data to determine baseline conditions for comparison to established water quality standards, which are related to beneficial uses for that watershed. This BMP would be implemented through the requirements of the 401 Water Quality Certification that would be obtained for the project, as well as the Sierra Meadow Hydrology Monitoring (SMHM) station installed (2017) to establish pre-project conditions. The station is currently collecting pre-project baseline data and will remain in place to collect post-project data.

- **BMP 7.8 Cumulative Off-site Watershed Effect:** This BMP serves to protect the identified beneficial uses of water from the combined effects of multiple management activities. Impacts of past and present activities, including impacts of proposed future management activities, were considered. Expected project effects have been documented in the hydrology report for this project, which are summarized in the Environmental Consequences section of this document.

Grazing

A fence would be installed around the restoration site once work is completed. Livestock would be excluded from grazing for two to three years. Once grazing resumes, impacts to the newly restored meadow would be monitored. Where necessary to protect sensitive areas, grazing management options would be considered by the Forest Service, in consultation with the permittee.

- Consider options for management of these meadows during preparation of annual operating instructions in conjunction with permittee, such as a change in numbers or the season of use, fencing, off-site watering, and mineral supplement placement.
- Monitoring recovery of native vegetation including shrubs, willow and rhizomatous sedges and rushes, and percent of areas that are bare soil will be used to determine the seasonal timing and length of annual use of the wet portions of the meadows to protect soils, stream banks, swales and native vegetation, including willows where appropriate.
- To protect hardwood regeneration in the restored meadows, allow livestock browse on no more than 10 percent of annual growth of woody plants to advance growth. Modify grazing permittee's annual operating instructions if hardwood regeneration and recruitment needs are not being met.

Soils

Standard mitigation measures have been developed under consultation with soil scientists and engineers as an integral component of meadow floodplain restoration. These mitigation measures have been monitored and refined based on previous projects of this type.

- Construction would occur during the low flow period and coincide with the most favorable moisture conditions to the depth of borrow site excavation. The excavated subsurface soil material is used to fill nearby channel incisions. This material requires enough moisture to allow for compaction to background condition of the native soil. The purpose of compaction is to preclude subsidence of the fill material during saturated conditions. Subsidence can lead to erosion of

the fill material. Utilization of on-site fill material allows the best match of soil types at the least cost. Material too wet to efficiently transport and work would be avoided. The subsurface (compacted) portions of the fill are constructed using the 'layer lift' method, which entails spreading the material in a thin veneer with each delivered bucket load of material. This repeated action, with occasional re-cutting of the working surface allows for efficient wheel compaction without supplemental equipment.

- Topsoil, and any organic material, in the area of excavation would be removed to a depth of approximately one foot and stockpiled adjacent to the channel fill. When the fill has achieved design elevation, the surface would be cross-rippled to restore infiltration capacity. Stockpiled sod and topsoil with associated organics and native seed bank would be spread across the fill with a low ground-pressure track loader. The final pass with equipment would roughen the topsoil surface to create microclimates for seed germination and to incorporate the topsoil with the surface of the subsoil. (BMPs 1.11, 5.1)
- Equipment travel into the project area would be restricted to identified access routes. As equipment leaves the area, any compaction resulting from construction would be scarified perpendicular to expected surface water flow and dressed with scattered organic material, as needed. (BMP 5.3)
- Staging areas and temporary haul routes used during construction would be minimized to reduce soil compaction and disturbance to the greatest extent possible. Especially minimize routes that are parallel to the flow path, which could concentrate overland flow and cause erosion. After construction, temporary project routes would be sub-soiled, perpendicular to surface flow directions, to the full depth of compaction to restore soil porosity. Areas with residual meadow sod would only be lightly scarified to preserve sod integrity. The emphasis is on the least soil disruption while loosening the soil. This technique has been successful in loosening the soil, restoring soil porosity, providing a high infiltration capacity, and thereby reducing cumulative watershed effects. (BMPs 1.11, 1.20, and 2.4) Extensive mixing or plowing will not be performed as it can have a negative effect on soil microorganisms.
- The project would require re-vegetation. Access routes are expected to have residual sod, and thus not require seeding, but may receive mulching and possibly seed, depending on the condition of the sod. Re-vegetation would consist of the following measures:
 - All desirable plant material excavated or buried in channel fills (i.e. sod, willows, etc.) would be removed and re-planted at key locations as needed

to protect soil. Locations of transplants are prioritized according to need. Priorities are to maximize soil protection in bare areas and areas of potentially high stress from flowing water.

- After spreading top soil on disturbed areas, the last step is to spread locally collected (or purchased) native seed and mulch. To ensure a good seed bed, this step is completed while the disturbed soil is still fluffy. If purchased, materials would be certified weed-free. To reduce the potential for weeds, choose locally collected materials over imported sources (see above Design Criteria for Botany).
- Plant or stake willow cuttings where appropriate to disperse flow.
- Implement grazing management changes if needed to protect soil resources (see above Design Criteria for Grazing).

Transportation

All temporary access routes created for purposes of implementing project activities would be permanently closed and restored to original grade. Before completion of the restoration work, 70% of ground cover will be returned to the access routes.

Visual Resources

The effects of the project are expected to enhance visual resources by improving the vigor of meadow vegetation. There would be effects to visual resources during construction. There would be some areas with limited vegetation in the first growing year, but these effects are short term. It is expected that after the first year, there would be no sign of human intervention in these meadows.

Wildlife

The following Wildlife Design Criteria and Conservation Measures are intended to reduce, minimize, or eliminate impacts to federally listed species. The federally listed species addressed in the Dry Meadow Biological Assessment (which includes the Dry Meadow project area) are mountain yellow-legged frog, California condor (both endangered) and Pacific fisher. Pacific fisher will not be discussed further because it is a forest-dwelling species, and there is no cover within this meadow restoration project area. RCA are defined as: 300 feet on each side of a perennial stream; 150 feet on each side of a seasonal stream; the top of the inner gorge of a stream adjacent to a >70% slope; and 300 feet from lakes, wet meadows, bogs, fens, wetlands, vernal pools and springs (or the edge of the riparian feature, whichever is greater).

- Within 100 feet of meadows, restrict vehicles and other operating equipment (rubber-tired skidder) to the roadway during entry and egress. Allow only

- essential vehicles in the meadow, and moist areas around the meadow. All other vehicles need to be kept out of meadow. This decreases risks of disturbing individual amphibians (including salamanders) in suitable breeding habitat.
- When equipment access routes are being opened (outside 100-foot zone), use existing routes present within RCA when possible. Minimize new access routes and contour perpendicular to the stream channel. Rehabilitate routes if needed (e.g. recondition furrows) and provide 50-90% ground cover after permanently closing. This lessens the risk of killing individual salamanders or frogs.
 - Utilize low velocity water pumps and screening devices for pumps (S&G 110) for water drafting. Drafting sites will be approved by the District Hydrologist and Biologist prior to use. Prevents mortality of eggs, tadpoles, juveniles, and adult frogs.
 - Water drafting sites will be located to avoid adverse effects to instream flows and depleting of pool habitat (S&G 101, BMP 2.5). Prevents mortality of eggs, tadpoles, juveniles, and adult frogs. Also prevents damage to young-of-the-year fish.
 - Access prohibitions and restrictions will be marked and mapped prior to commencement of operations (BMP 1.4). This includes seeps, springs, and streams near access routes. Provides for protection of sensitive aquatic features during operations.
 - Limit operating period from May through August for entering within 100 feet of the meadows for nesting birds and active salamanders (BMP 1.5). Provides for protection of breeding birds and amphibians.
 - Store fuels and other toxic materials outside of RCAs (S&G 99) to limit the exposure of amphibians to toxic materials associated with restoration activities. Prevents mortality of amphibians.
 - To prevent contamination of waters from accidental spills of hazardous substances, an emergency response plan will be created and implemented (BMP 7.4). Prevents mortality of amphibians.
 - Leave all willows intact if possible, if not, dig out root ball and replace after construction, or re-plant where they would naturally occur at each site. Retains potential little willow flycatcher habitat.
 - While there are no fish known to occur in the project area, if fish are present in the meadow at the time work is to start, fish will be seined and removed from the work area; put in buckets with fresh stream water; and moved immediately to an adjacent reach of the same stream channel. Blocking nets will be placed to prevent the fish from returning.
 - The meadow will be surveyed annually to ensure and document the continued absence of non-native bullfrogs (or other non-native species).

The following Conservation Measures are to protect mountain yellow-legged frogs:

- A Service-approved biologist knowledgeable in the life histories and ecologies of yellow-legged frogs will prepare a training program for construction personnel. The training will describe the species, the Endangered Species Act, the definition of 'take,' and all Conservation Measures applicable to their scope of work. The

Service-approved biologist will provide a handout of the Conservation Measures to each crew member during training.

- The applicant will maintain records, and notify the Service, of any listed species observations within the project area. The applicant will immediately notify the Service if any injury or mortality to listed species occurs as a result of project activities.
- All project personnel who may potentially enter meadows, streams or riparian areas during pre-construction, construction, or maintenance of the project will follow the Forest Service's decontamination protocol to prevent spread of *Batrachochytrium dendrobatidis* (Chytrid fungus). All project personnel will follow decontamination procedures before entering meadows, streams and riparian areas, and again prior to entering adjacent aquatic habitat. A copy of the protocol will be provided to all project personnel during environmental briefing. Decontamination kits will be kept onsite, with a copy of the protocol, for all phases of implementation of this project. All equipment will be free of mud and dirt prior to bringing it into the Sequoia National Forest to prevent the spread of Chytrid fungus.
- Timing of work would coincide with late summer dry period.
- Use mats or other methods to minimize impacts to upland meadow areas and riparian conservation areas.
- No drafting sites will be located in or around Bull Run Creek or associated tributaries.
- If water diversion is necessary for any project related activities, no de-watering of suitable stream habitats will occur during implementation, even if temporarily.
- Equipment, when not in use, will be stored in upland areas outside of the boundaries of waterways/wet meadows.
- When handling and/or storing chemicals (fuel, hydraulic fluid, etc.) necessary for equipment near waterways, applicable BMPs will be followed to prevent spills and contamination; any and all applicable laws and regulations will be followed. Appropriate materials will be stored and accessible on site to prevent and manage spills. Service and refueling procedures will not be conducted where there is potential for fuel spills to seep or wash into waterways.
- Dedicated fueling areas and refueling practices will be designated to prevent storm water run-off and will be located at least 50 feet from downslope drainage and water courses. Fueling will be performed on level-grade areas.
- All construction equipment will be well maintained to prevent leaks of fuels, lubricants or other fluids into waters of the United States.
- During project activities, all trash that may attract predators will be properly contained in covered garbage receptacles and removed from the site daily. Following treatment, all debris will be removed from project sites.
- Spill containment kits will be maintained onsite at all times during construction operations and/or staging or fueling of equipment.
- Drafting intakes will be completely screened with wire mesh no larger than 0.2 inch.
- Use only water for dust abatement within 165 feet of streams and hydrologically connected tributaries or meadows. If water diversion is necessary for any project

- related activities, no de-watering of suitable stream habitats will occur during implementation, even if temporarily.
- If necessary, silt fencing or straw wattles will be installed to prevent or reduce sediment from entering the stream channels or meadow habitat.
 - Prior to starting project work, inspection of the work site will take place to locate any MYLF individuals that have moved into the area. If species are found directly within the project area prior to work or during daily work, project activities will stop until individuals can be moved by the Forest Aquatic biologist to a safe location.
 - Install thermograph device to monitor stream temperature.

The following Conservation Measures are specifically to protect California condor:

- Monitoring of the condor satellite tracking website for condor activity will be conducted prior to restoration activities.
- If condor satellite tracking suggests use of a roost site in any part of the project area, a limiting operating period restricting activities within 1/2 mile radius of the roost site will be implemented. The duration of the LOP will be determined in consultation with the Service, Condor Recovery Team, and the Forest Biologist.

The following wildlife design criteria reiterate soil and hydrology criteria. All are designed to protect water quality, which is also an important protection for fish and wildlife species:

- A project-specific erosion control plan will be developed by the District Hydrologist to effectively limit and mitigate erosion and sedimentation from any ground-disturbing activities, through planning prior to commencement of project activity, and through project management and administration during project implementation (S&G 2.13).
- The risk of increased sedimentation from mechanical ground disturbing activities within RCAs or meadow surfaces will be minimized by ensuring that the activity is consistent with RCO's (S&G 92, 113). Ensure that Best Management Practices (BMPs) reduce risk of erosion.
- The soil mantle will be protected from excessive disturbance to maintain the integrity of the SMZ and other sensitive watershed areas (BMP 1.11).
- Provide appropriate erosion and sedimentation protection for disturbed areas by spreading slash, mulch, or wood chips (or, by agreement, some other treatment) on portions of areas impacted by equipment or temporary road fills (BMP 1.14).
- Minimize erosion by ensuring that erosion-control structures are stabilized and working (BMP 1.20).
- Water quality will be maintained or improved by protecting sensitive areas from degradation. Any slash that is generated from thinning or opening access routes would be used on site, and moved by hand, or moved by equipment with care to minimize ground disturbance or erosion (BMP 1.22).

- For soil-disturbing treatments, preventative measures will be implemented to minimize sediment production (BMP 5.1). Preventative measures will be identified for each specific site.
- Aquatic invasive species will be monitored visually and by frog calls for a minimum of five years after implementation.

Project Monitoring

The Dry Meadow Restoration Project is expected to benefit multiple resources by restoring the hydrologic and ecological function of the channel/meadow floodplain system. The purpose of project monitoring is to measure project effectiveness of the restoration actions. Project monitoring would coincide with other forest monitoring as applicable. Parameters and methods identified in Table 1 would be used to monitor project effectiveness before and after restoration.

Table 1. Project Effectiveness Monitoring Parameters for the Proposed Action.

Monitoring Parameter	Method	Responsible Party
Water & Air Temperature	Continuous recording data logger installed within and below project area May-Sept*	Plumas Corporation (as accessible)
Aquatic Habitat	California Rapid Assessment Method (CRAM) conducted once pre- and post-project	Plumas Corporation
Groundwater Elevation	4 groundwater wells (approximately 6 to 12 ft. in depth) made of 3/4" galvanized perforated pipe, measured monthly*	Plumas Corporation
Stream Flow & Groundwater Interaction	Staff gage and pressure transducer installed at the bottom of project area; monthly* manual calibration flow measurements; quarterly* collection of oxygen isotope samples and measurement of electrical conductivity (EC) from inflows, springs, and wells	Plumas Corp, and California State University, Sacramento (CSUS)
Soil Porosity	Seismic surveys	CSUS
Meadow Vegetation	Vegetation communities would be mapped pre- and post-construction. Revegetated areas would be monitored for three years following project completion. Monitoring will quantify planting survival, percent cover of native meadow vegetation. Noxious weeds would be removed by hand-pulling.	Plumas Corporation & USFS

*During months when site is accessible.

Tiering and Incorporation by Reference

In order to eliminate repetitive discussion and documentation, the following documents prepared for this analysis are incorporated by reference. The documents are available in the Project File at the Sequoia National Forest Supervisor's Office:

Sequoia National Forest Land and Resource Management Plan (1988) as amended by the Sierra Nevada Forest Plan Amendment (2004), and the Mediated Settlement Agreement (1990).

Dry Meadow Restoration Project: Hydrology Report and Erosion Control Plan (Jim Wilcox, Plumas Corporation, June 2018)

Tobias Ecosystem Restoration Project Biological Evaluation/ Assessment (Plants) Fletcher Linton, Forest Botanist, Sequoia National Monument and Sequoia NF. July 2015)

Biological Assessment of the Dry Meadow Restoration Project (Nina Hemphill February 2019)

Programmatic Biological Opinion on Nine Forest Programs on Nine National Forests in the Sierra Nevada of California for the Endangered Sierra Nevada Yellow-legged Frog, Endangered Northern Distinct Population Segment of the Mountain Yellow-legged Frog, and Threatened Yosemite Toad (FF08ESMF00-2014-F-0557)
(U.S. Department of Interior, Fish & Wildlife Service, 2014/2015)

Heritage Survey and Evaluation Report for the Dry Meadow Restoration Project
(Diane McCombs, M.A. RPA, McCombs Archaeology, July 2016)

Comparison of Alternatives

Achievement of Purpose and Need

The purpose of this project is to restore the physical and biological functions of the meadow by improving hydrologic connectivity and processes in the meadow complex which would allow flood flows to access the meadow floodplain. The achievement of the purpose and need is used for a general comparison of the two alternatives (the Proposed Action, and the No Action Alternative) for this project. Issues that were raised during project development and scoping are summarized in Table 2. Issues (and impacts to other resources) are further discussed under the subsequent Environmental Consequences section, as well as in specialist reports in the project record.

Proposed Action – Alternative 1

The proposed hydrologic treatment entails eliminating the incised channels as the primary drainage features using a series of plugs, and restoring flow to the surface of the meadow. Implementation would restore the hydrologic function of the meadow ecosystems by allowing for more frequent sheet-flow flooding of the meadow floodplain that would enhance infiltration and retain moisture in the meadow longer into the summer season. This would successfully achieve the purpose and need as it relates to channel/meadow floodplain hydrologic function.

Hand thinning of small conifers (<10-inch diameter) in designated upland areas would create trail openings for cattle to travel around the meadow instead of through the meadow floodplain. This would improve the resilience to fire of the meadow by changing fire behavior before fire enters the meadow. It would reduce conifer encroachment around the meadow. In general it will improve the ecology of the riparian areas around the meadow and its tributaries.

Restoration of Meadow only -Alternative 2

The proposed hydrologic treatment entails eliminating the incised channels as the primary drainage features using a series of plugs, and restoring flow to the surface of the meadow. Implementation would restore the hydrologic function of the meadow ecosystems by allowing for more frequent sheet-flow flooding of the meadow floodplain that would enhance infiltration and retain moisture in the meadow longer into the summer season. This would successfully achieve the purpose and need as it relates to channel/meadow floodplain hydrologic function.

No Action – Alternative 3

Under the current conditions in the meadow, groundwater levels have been lowered due to gullied stream channels that appear to have been excavated to dry the meadow out. Hydrologic processes of the meadow ecosystem have been lost due to lack of connectivity between the stream channel and the meadow floodplain. The infrequent flooding of the meadow floodplain due to channel incision has resulted in dysfunctional meadow hydrology that is trending the vegetative community to a more xeric (dry), versus a moist plant community. The No Action Alternative would not meet the purpose and need as it relates to meadow floodplain function.

Table 2. Comparison of Alternatives and Substantial Issues

Issue 1. Project design that creates ponded water in the borrow areas.

Alternative 1 Proposed Action	Sheet flow and floodplain function restored to Dry Meadow water levels within the floodplain borrow sites anticipated to reflect the rise and fall of the groundwater elevation.
Alternative 2 Meadow restoration Only	Sheet flow and floodplain function restored to Dry Meadow water levels within the floodplain borrow sites anticipated to reflect the rise and fall of the groundwater elevation.
Alternative 3 No Action	No restoration of sheet flow function in any meadow, and no floodplain borrow sites.
Issue 2. Potential negative impacts of cattle grazing to restored meadows.	
Alternative 1 Proposed Action	Temporary fencing for 2-3 years of rest from grazing. Annual Operating instructions will reflect protections needed for riparian vegetation.
Alternative 2 Meadow restoration Only	Temporary fencing for 2-3 years of rest from grazing. Annual Operating instructions will reflect protections needed for riparian vegetation.
Alternative 3 No Action	Continued monitoring of cattle grazing impacts per allotment management plan.

Environmental Consequences

This section contains a summary of the environmental impacts of two Alternatives with regard to environmental effects as described at 40 CFR 1508.27. A more detailed analysis of the environmental impacts can be found in the Project Record.

This section will cover the No Action alternative (Alternative #2) first because it provides a reference point for describing environmental effects of the action alternatives.

Effects Relative to Issues Identified Through Scoping

Issue #1: There is a concern with creating ponds adjacent to in-stream channel fills and/or in the meadow floodplain. Alternatives to eliminating floodplain borrow sites is preferred, with the end-goal to restore sheet flow similar

to what existed prior to grazing and other human-induced impacts that channelized the meadows. Any design using the pond and plug method that creates ponds in the meadow floodplain should include a plan and design criteria to eventually fill the ponds, either naturally or through some other low impact infill method. Plugs should also be designed to support wetland vegetation, and not upland vegetation. This may require a future entry into each meadow, by design, to eventually restore the entire meadow to its original grade and sheet-flow function. Any future entry should be incorporated into the proposed design of the project.

Indicator Measure: acreage of floodplain ponds (i.e. perennial ponded water)

No Action

Current management practices such as livestock grazing and dispersed recreation would continue to take place in the project area. No meadow restoration would be accomplished with this alternative. The No Action alternative would address Issue #1 by not doing anything in the meadow that would create more ponded water (there is currently one perennial pond in the project area).

Proposed Action And The Meadow Restoration Only

Implementation of either action alternative would occur as described above. Ponded water is avoided when possible, but Dry Meadow is like many others, with resource constraints on the slopes around the meadow that preclude the use of slope material. Only one slope borrow area was feasible (on the Tobias Fork). This borrow area would be excavated to floodplain elevation to avoid ponded water. In the rest of the borrow areas in the meadow, the elevation and duration of water levels would depend on the groundwater elevation in the meadow, and would be either perennial or seasonal, depending on groundwater.

The creation of ponds in the meadow floodplain would not affect the goal of restoring the sheet flow function of the meadow floodplain. The “pond and plug” meadow restoration technique has successfully restored the floodplain function of three degraded meadows (Big Meadows 2007, Long Meadow 2014, and Osa Meadow 2016) in the Sequoia National Forest by plugging off the gullied incised channels, redirecting flow into remnant channels on the meadow surface, and restoring a sheet flow system across the meadow floodplain.

Both Action alternative addresses Issue #1 by considering slope borrow areas during project design. All plugs and borrow pond areas are configured to accommodate surface and subsurface through flow, as well as adjacent hillslope-generated surface and groundwater inflows. Some pond and plug project areas have seen some natural infilling

of ponds over time; however, the amount of material mobilized from flood events is likely to take decades or longer to fill the borrow areas.

Planning for future entry into the meadows to fill the floodplain borrow sites is not feasible for the following two reasons: 1) After restoration, meadow conditions are expected to be much more wet, and therefore not conducive to the use of heavy equipment needed to fill the ponds without causing significant damage. 2) The availability of local native fill material will still be an issue.

The use of native on-site fill material (from the floodplain or along upland meadow margins) is desirable for three reasons: First and foremost, local material is compatible with onsite conditions such as soil porosity, compaction levels, and native seed sources. Second, it diminishes the opportunity for introduction of non-native species such as noxious weeds from outside the watershed. Lastly, it makes implementation of the project economically feasible. Importing fill material to this remote location is cost-prohibitive, and would make restoration of Dry Meadow infeasible. It should also be noted that ponded water in floodplain borrow sites are similar to ponds created from beaver activity, and there is already an existing pond on site. The presence of beavers and their channel damming activities has been documented on similar meadow restoration projects in the northern Sierras.

One of the primary reasons often cited against “pond and plug” restoration, is that floodplain borrow cuts result in perennially ponded water that can support non-native species, particularly, bullfrogs, which can out-compete and prey upon native species. It is unlikely that bullfrogs would become established in Dry Meadow for the following reasons: 1) Bullfrogs are known to occur throughout California, but not in higher elevations of the Sierra Nevada. Due to distances and steep terrain, bullfrogs are not likely to naturally colonize the project area. It is also in a fairly remote location; so it is unlikely humans would introduce them. 2) The cold winter temperatures and short season would likely result in bullfrogs requiring two years to metamorphose from tadpoles into frogs. This long period would make them more susceptible to predation, and they would only likely be able to metamorphose in the areas with perennially ponded water. 3) The Design Criteria include annual summer surveys for bullfrogs.

Issue #2: The effect of continued cattle grazing on the restored meadow was raised as a concern.

No Action

Current management practices such as livestock grazing and infrequent dispersed recreation would continue to take place in the project area. Under this alternative, minor

changes to grazing management may be implemented (such as placement of mineral supplements) in response to normal grazing management monitoring by the Forest Service. Other changes would not occur. The No Action alternative would not address Issue #2 because there would be no change to grazing management.

Proposed Action and Meadow Restoration only

The project area would be rested from grazing for two to three years with the use of a temporary fence. Grazing Design Criteria for the action alternatives also includes continued monitoring of grazing in the restored meadow. If protection of meadow resources requires changes, options could include a change in numbers or the season of use, more permanent fencing, off-site watering, or mineral supplement placement. This alternative would address Issue #2 by resting the project area from grazing for two to three years, and considering other grazing management options. The restored meadow would also likely produce more forage of higher quality, and therefore could result in less cattle impact by spreading the animals over a larger area.

Effects Relative to the Finding of No Significant Impact (FONSI) Elements

In 1978, the Council on Environmental Quality published regulations for implementing the National Environmental Policy Act (NEPA). These regulations (40 CFR 1500-1508) include a definition of “significant” as used in NEPA. The ten elements of this definition are critical to reducing paperwork through use of a finding of no significant impact (FONSI) when an action would not have a significant effect on the human environment, and is therefore exempt from requirements to prepare an environmental impact statement (EIS). Significance as used in NEPA requires consideration of the following ten intensity factors in the appropriate context for that factor.

Mitigations and management requirements designed to reduce the potential for adverse impacts were incorporated into the proposed action, including standards and guidelines outlined in the Sequoia National Forest LRMP (USDA Forest Service 1988), as amended by the Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004), Best Management Practices, and project-specific design criteria based on resource specialist knowledge and experience. These management requirements would minimize or eliminate the potential for adverse impacts caused by the proposed project.

Context

For the analyzed alternatives, the context of the environmental effects is based on the environmental analysis in this EA. All of the resource analyses identified the spatial and temporal bounds of their analysis, based upon the potential environmental impacts. These impacts are well known, as the proposed activities have all previously occurred on

the Sequoia National Forest. The potential environmental effects would be localized to the project area, and would not be measurable at a regional or larger scale.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this EA and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. A finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

A discussion of potential direct and indirect effects is summarized below. Cumulative effects are discussed under FONSI Element 7. All analyses prepared in support of this EA considered both beneficial and adverse effects, but all effects determinations were made only on the basis of adverse effects. None of the potential adverse effects of the proposed action or alternatives would be significant, even when considered separately from the beneficial effects that occur in conjunction with those adverse effects.

Botanical Resources

The project area was surveyed for threatened, endangered and sensitive plants in 2016. There are no federally or state listed endangered or threatened plant species or suitable habitats within the project area. There are two Forest Service Sensitive Species with potential habitat in the project area: Shirley Meadow Star Tulip (*Calochortus westonii*), and Greenhorn Fritillary (*Fritillaria brandegeei*), however, neither species occurs in the area.

No Action (Alternative 2)

Direct and Indirect Effects

Under this alternative there would be no direct, indirect, or cumulative effects to federal- or state-listed endangered or threatened plant species or suitable habitats within the project area. There would not be any direct, indirect, or cumulative effects to undiscovered individuals or habitat of Shirley Meadow star-tulip (*Calochortus westonii*), and Greenhorn fritillary (*Fritillaria brandegeei*).

The continued degradation of meadow habitat may lead to a downward trend for Forest Service sensitive plant species and species of local interest that are dependent on high water tables, including scalloped moonwort (*Botrychium crenulatum*), field ivesia (*Ivesia*

campestris), and gray-leaved violet (*Viola pinetorum* var. *grisea*). However, none of these species occur in the project area.

Proposed Action (Alternative 1)

Direct and Indirect Effects

There are no federally or state listed endangered or threatened plant species or suitable habitats within the project area, so there would be no direct effects on any listed species, or on the three sensitive species with suitable habitat in the area. Indirect negative effects would include spread of noxious weeds or compaction of soils and trampling of unknown plant occurrences. Mitigations (Design Criteria listed above) have been incorporated to protect known and newly discovered plant populations, deter the spread of noxious weeds, and decrease the chance for soils to be compacted in or near the project area during implementation. There would be an indirect beneficial effect to FS sensitive species dependent on high water tables, whose habitat would be improved through increased acreage of wet meadow habitat under the action alternative.

Wildlife

The following tables present the aquatic and terrestrial wildlife species from the CNDDDB, USFWS, and Regional Forester's lists that were considered in this analysis. (Definitions: FP = State Fully Protected; FT = Federal Threatened; FE = Federal Endangered; FS = Forest Sensitive Species within the Sequoia National Forest; SA = CDFW Special Animal; SE = State Endangered; ST = State Threatened; SSC = State Species of Special Concern)

Table 3. Listed and FS-Sensitive aquatic wildlife species that may potentially occur in the project area.

Species	Listing Status	Analysis Comments
Fish		
Delta smelt (<i>Hypomesus transpacificus</i>)	FT; SE	Project area has no connection to delta – no further analysis.
Hardhead Minnow (<i>Mylopharodon conocephalus</i>)	FS; SSC	Due to Isabella Lake, no connection to project area – no further analysis
Kern brook lamprey (<i>Lampetra hubbsi</i>)	FS	Not in Kern River watershed – no further analysis.
California golden trout (<i>Oncorhynchus mykiss aguabonita</i>)	FS	Not in north fork of Kern River – no further analysis

Species	Listing Status	Analysis Comments
Kern River rainbow trout (<i>Oncorhynchus mykiss gilberti</i>)	FS	Confined to headwaters, would not occur in project area – no further analysis.
Amphibians		
Greenhorn Mountain slender salamander (<i>Batrachoseps altasierrae</i>)	FS	While it may occur in pine plantations in areas upslope from the meadow it is not known (CNNDDB) from the meadow or is environs in Bull Run Basin .
Fairview salamander (<i>Batrachoseps bramei</i>)	FS	Unlikely in project area.
Relictual slender salamander (<i>Batrachoseps relictus</i>)	FS	Not in project area – no CNNDDB records and not in known range
Kern Canyon salamander (<i>Batrachoseps simatus</i>)	FS	Not in project area – no CNNDDB records and not in known range
Yellow-blotched salamander (<i>Ensatina eschscholtzii croceater</i>)	FS	Not in project area – no CNNDDB records and not in known range
Kern Plateau slender salamander (<i>Batrachoseps robustus</i>)	SSC	Project not in range of this species – no further analysis.
Foothill yellow-legged frog (<i>Rana boylei</i>)	FS	Unlikely, but may occur in project area
Mountain yellow-legged frog (MYLF) (<i>Rana muscosa</i>)	FE, SE, FS	Unlikely, but may occur in project area. There is suitable habitat in project area.
Reptiles		
Western pond turtle (WPT) (<i>Actinemys marmorata</i>)	FS; SSC	Unlikely in project area.
California legless lizard (<i>Anniella pulchra</i>)	FS	Not in project area – no CNNDDB records, the area where the work is to be done is currently very dry. Unlikely to occur in project area.

Table 3a. Listed and FS-Sensitive terrestrial wildlife species that may potentially occur in the project area.

Species	Listing Status*	Analysis Comments
Mammals		

Pacific marten (<i>Martes caurina</i>)	FS	All forest habitat species, and unlikely to occur in this meadow project area. No further analysis.
Pacific fisher (<i>Pekania [= Martes] pennanti pacifica</i>)	FS; SSC; FT-Proposed	Unlikely to occur in this meadow project area. No cover habitat available.
Wolverine (<i>Gulo gulo</i>)	FS; ST; FT-Proposed	All forest habitat species, and unlikely to occur in this meadow project area. No further analysis
Pallid bat (<i>Antrozous pallidus</i>)	FS; SSC	No CNNDB records but bats could use meadow for foraging or roost but not nesting. No further analysis.
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	FS; SSC	No CNNDB records but bats could use meadow for foraging but not nesting or roost. No further analysis.
Fringed myotis bat (<i>Myotis thysanodes</i>)	FS	No CNNDB records but bats could use meadow for foraging but not nesting or roosting. No further analysis.
Birds		
California condor (<i>Gymnogyps californianus</i>)	FE	May travel near the project area.
Western yellow-billed cuckoo (<i>Coccyzus americanus occidentalis</i>)	FS	Unlikely in project area, no further analysis.
California spotted owl (<i>Strix occidentalis occidentalis</i>)	FS; SSC	Despite Cedar fire, may occur in pines in upland areas of Bull Run Basin. No nesting habitat within project area.
Northern goshawk (<i>Accipiter gentilis</i>)	FS; SSC	Unlikely in project area, no further analysis.
American bald eagle (<i>Haliaeetus leucocephalus</i>)	FS; SE; FP	Project area too small for this species, no further analysis.
Great gray owl (<i>Strix nebulosa</i>)	FS; SE	Unlikely in project area – too low elevation & far from wilderness.
Little Willow flycatcher (<i>Empidonax traillii</i>)	FS; SE	Currently unsuitable habitat.

Black swift (<i>Cypseloides niger</i>)	SSC	Found in cliffs in Kern River, may occur near project area.
Invertebrates		
Tehachapi fritillary butterfly (<i>Speyeria egleis tehachapina</i>)	FS	Unlikely to occur in project area, no further analysis.

*FP = State Fully Protected; FT = Federal Threatened; FE = Federal Endangered; FS = Forest Sensitive Species within the Sequoia National Forest; SA = CDFW Special Animal; SE = State Endangered; ST = State Threatened; SSC = State Species of Special Concern

Aquatic Wildlife

No Action (Alternative 3)

Direct and Indirect Effects

There is one aquatic federally listed endangered species, the mountain yellow-legged frog (*Rana muscosa*, MYLF), that has suitable habitat within the project area. Possible effects on MYLF are discussed further under FONSI elements 7 (Cumulative Effects), and 9 (Endangered Species Act). There are no critical habitats within the project area, and no frogs have been found in the project area. Wet meadows can provide habitat for juvenile and adult mountain yellow-legged frogs. Under No Action, the continued degradation and drying of wet meadow habitat would have a long-term indirect adverse effect on mountain yellow-legged frog suitable habitat.

No Forest Service Sensitive Species or California State Species of Concern were found in the meadow area (CNNDDB). The continued loss of the hydrologic and ecological functions under this alternative would have an adverse indirect effect on aquatic species and may be the reason no species are present in the meadow.

Proposed Action (Alternative 1) and Meadow Restoration Only (Alternative 2)

Direct and Indirect Effects

There is one aquatic federally listed endangered species, the mountain yellow-legged frog (*Rana muscosa*, MYLF). The areas between perennial and intermittent streams, ephemeral streams, and meadows and seeps across the landscape are part of the habitat complex needed for aquatic wildlife. The current conditions in the meadow have eliminated connectivity of habitat. Direct negative short term effects from construction activities on aquatic species is highly unlikely given the lack of habitat in the area and the lack of observations. Direct and indirect long term effects would be beneficial by improving and increasing acreage of aquatic habitats through restoration of hydrologic functions. The project would provide additional connectivity of habitat by lengthening the period when the meadow is wet, and providing extended base flows resulting in long-term beneficial indirect effects on aquatic species. A potential adverse indirect long term

effect to aquatic species is an increase in the extent of ponded water that may provide habitat for non-native bullfrogs. This is not expected to be a significant effect, as discussed above under Effects Relative to Issues (under Issue #1). In summary, there is no nearby source population; the sites are remote and high elevation; there already is ponded water in the project area; and monitoring would ensure that bullfrogs would be detected early (when the population numbers are small), so that action could be taken for their removal.

Design Criteria (listed above in the Proposed Action) have been incorporated to protect known and newly discovered aquatic species populations in or near the project area during implementation, and to minimize short-term direct and indirect adverse effects to individuals and habitat.

Terrestrial Wildlife

No Action (Alternative 3)

Direct and Indirect Effects

There is one federally endangered terrestrial wildlife species with potential suitable habitat known to occur within 30 miles of the project area- California condor (*Gymnogyps californianus*). There are no designated critical habitats within the project area, and this species has not been observed in the project area. There is one species proposed for federal listing near the project area, the Pacific Fisher (*Martes pennant pacifica*).

Proposed Action (Alternative 1) and Meadow Restoration Only (Alternative 2)

Direct and Indirect Effects

The federally endangered wildlife species, California condor, has not nested or roosted in the project area, nor is there designated critical habitat within the project area. Potential suitable habitat occurs near the project area but would not be adversely affected by the proposed restoration actions. While Condor are attracted to dead animals, they are not attracted to meadows. Therefore, we are unlikely to have any effect on California condor.

The federal candidate species, Pacific fisher, has been documented in the Bull Run Creek drainage, and adjacent areas. Montane meadows habitats if they support riparian vegetation are used for connectivity by fisher. . Since there is currently little cover in the area to be restored, direct effects on fisher are unlikely. Therefore, there would be no direct, indirect, or cumulative effects on this species, and no further analysis of this project on this species. Further project activities will occur after the breeding season. Therefore, we are unlikely to have any effect on Pacific Fisher.

Mitigations (Wildlife Design Criteria listed above) have been incorporated to protect known and newly discovered wildlife populations or individuals in or near the project area during implementation.

Hydrologic and Soil Resources

No Action (Alternative 3)

Direct and Indirect Effects

Alternative 2 would allow active headcutting to continue in Dry Meadow, and continue the drying trend. The existing incised channels would continue to enlarge from erosion, creating a vicious circle that captures more and more flow until an adequate floodplain width is reached at the incised channel elevation. The existing meadow floodplain would continue to dry out, as a new floodplain is formed at the lowered elevation. These degradational processes would continue to lower the water table, contribute to excessive erosion, and increase stream channel instability. These conditions, in turn, negatively affect water quality and aquatic habitat quality. Eroded soil deposits as sediment in stream channels, thus eliminating the interstitial spaces between rocks and gravels that are occupied by aquatic organisms. The deposited sediment also increases nutrients in the water, resulting in algal blooms, and decreased dissolved oxygen when those blooms die off. As soil is washed away, the roots of riparian vegetation become exposed, thus decreasing the vigor of riparian vegetation. Vigorous riparian vegetation provides shading that cools water temperatures, and provides microhabitats for aquatic life in the stream channel. Under this alternative, these degradational trends would continue.

Proposed Action (Alternative 1) and Meadow Restoration Only (Alternative 2) Direct and Indirect Effects

Alternative 1 would allow restoration efforts to occur within Dry Meadow. Restoration techniques include plugging the incised channels, using material from floodplain and slope/terrace borrow areas. To stabilize the treatment, a rocked valley grade control structure would be built at the bottom of the meadow, and bare areas would be re-vegetated.

Restoration activities have the potential for both positive and negative effects. The proposal includes elimination of headcuts and incised stream channels, which are promoting the loss of meadow function and habitat. The work would restore the hydrologic base level of the meadow, which means a higher elevation water table, increased seasonal water retention, reduced sediment transport back to natural background rates, and stopping headcut migration further up the meadow. The

reactivation of the meadow floodplain would encourage deposition of soil particles, rather than erosion of gully walls. The mulch and planted vegetation (sod, seeds, willows) would enhance the depositional processes, and filter suspended sediment under normal runoff flows. It is expected that in one year, the beneficial effects of the connectivity of the channel and meadow floodplains would be visible in the form of standing water across portions of the meadow later into the growing season, and regeneration of more riparian vegetation.

Heavy equipment would be used during construction. Access to the meadow would be via old or existing routes where possible. Designated new routes would have minimal disturbance; equipment would travel over native material, and there would be no ground clearing. Where needed, water bars and/or rolling dips would be installed to prevent erosion. Dust abatement practices would also be followed as necessary during construction. The equipment may negatively affect the meadow by compacting the soil, and creating areas free vegetation. Compacted soil could reduce infiltration of precipitation. Bare areas could erode in overland flow events, carrying soil into stream channels. These areas would be seeded and temporarily stabilized with native mulch materials until seeds and vegetation become established (in one to two years). Best Management Practices listed above in the Design Criteria section of this document would be implemented to protect water quality and meadow plants and soils. All access roads would be permanently closed and restored to pre-project condition once the project is complete. Construction activities would minimize negative effects by limiting travel corridors; whenever possible, using tracked versus wheeled equipment to reduce native soil compaction; implementing the project under the driest soil conditions and lowest stream flows; and seeding, mulching, and transplanting existing vegetation. In the long term, infiltration of precipitation is expected to increase over existing levels via the improved rooting structure of riparian vegetation.

Servicing and refueling of equipment would follow Best Management Practices to eliminate short term concerns for water contamination. Any servicing or refueling operations would be located a minimum of 100 feet away from the meadow edge. Site specific locations for equipment fueling would be identified during project layout. Refueling and servicing would occur only at these locations. A non-porous mat would be used at the servicing/refueling areas.

Water temperatures and flows are not expected to be negatively affected in the short or long term. Water temperature and flow are currently measured at the bottom of the meadow at a continuous recording station. Monitoring of similar projects has shown that water temperatures generally decrease in restored meadows within one year, via the improved exchange of groundwater and surface water. During construction, the meadow

is expected to be dry. However, depending on the water year, there may be water in the perennial Tobias channel. In areas to be filled, water would immediately access a remnant channel.

Once the meadows are re-watered and soil moisture improves, cattle grazing may cause an indirect effect on the restored hydrology via trailing in the softened meadow soils. Excessive trailing may result in compaction and deepening that concentrates floodplain sheet flow, causing a channel to form. Impacts of grazing are annually monitored. To reduce this indirect negative effect, range management options listed in the Design Criteria may be implemented. If new fence lines are proposed, they would not run parallel to overland sheet flow drainage in the meadows to reduce impacts of fence-induced trailing.

The Dry Meadow Restoration Project would be monitored to measure project effectiveness. Parameters used to measure the effectiveness of restoration are outlined in Table 1.

In summary, Alternative 2 (No Action) provides the least amount of benefits in regards to soil and hydrology. Allowing the headcuts and incised channels to continue eroding would negatively affect water quality and increase the loss of aquatic habitat. The Proposed Action would have short-term disturbances to soils, water quality, and aquatic habitat. However, mitigation measures would minimize the short-term disturbances created during project implementation. Upon completing the project, the long-term benefits to these resources outweigh the short-term disturbances.

2) The degree to which the proposed action affects public health or safety.

The meadow restoration is expected to have minimal effect on public health or safety. Creation of ponds in the meadow floodplain could potentially increase public use of some meadow sites, offering recreational opportunities, such as fishing and swimming, which did not exist prior to the restoration. The public uses of the meadows, however, would not change safety risks already associated with outdoor recreation on public lands.

3) Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

The site has been surveyed and evaluated by a qualified archeologist, and no qualifying historic properties are located within the project area boundaries. There are no parklands, prime farmland, wild and scenic rivers, or designated ecologically critical areas in the project area. The purpose of the project is to restore the natural ecological and

hydrologic functions of the meadow. All constructed features use natural materials and enhance already existing landscape features. Construction of the meadow restoration features would not change the unique character of the area but would re-establish the natural ecological and hydrologic functions of the meadow, restoring the meadow wetland that once existed. The wetlands created from the floodplain borrow sites would, to some extent, mimic naturally created beaver ponds. In functioning meadow systems, beaver ponds are often prevalent and provide the natural structural hydrologic controls that maintain healthy wetland meadow ecosystems.

4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

Controversy in this context refers to cases where there is substantial dispute as to the size, nature, or effect of Federal action, rather than opposition to its adoption. The proposed project follows the management direction in the Sequoia National Forest Land and Resource Management Plan (USDA Forest Service, 1988), as amended by Sierra Nevada Forest Plan Amendment Record of Decision (USDA Forest Service, 2004), and is consistent with the Mediated Settlement Agreement (SQF MSA, 1990).

The project would utilize the “pond and plug” restoration technique. The effect of this technique on amphibians has been recently debated by the scientific community, with controversy stemming from the potential colonization and proliferation of non-native bullfrogs in ponds in some restored areas. This effect was discussed above under Environmental Effects Relative to Issues, and under FONSI Element #1.

Effects on the quality of the human environment from the proposed activity are unlikely to be controversial. Meadows are recognized as important ecologic and hydrologic components of the Sierra Nevada ecosystem, and implementation of the Project is consistent with several federal, state, and private organization plans. For example, the Forest Service’s 2011 Region 5 Ecological Restoration Leadership Intent states, “Our goal for the Pacific Southwest Region is to retain and restore ecological resilience of USFS lands to achieve sustainable ecosystems.” Objectives of the 2015 State Wildlife Action Plan, Conservation Strategy 4, include improve water quality and temperature, restore meadow hydrology, improve surface water recharge, reduce erosion and bank cutting, and reduce effects of extreme events through flood attenuation to improve wildlife habitat. The 2014 California Water Action Plan also calls for the following actions: “Protect and restore important ecosystems; manage and prepare for dry periods; and increase flood protection.” Lastly, the Association of California Water Agencies 2013 Initiative to Improve the Resiliency of California's Headwaters recommends, “Improved headwaters management must become a high priority for state, federal and local agencies; agencies at all levels should find ways to help public and private

landowners restore meadows and watersheds to improve their critical functions and reduce wildfire impacts; stakeholders at all levels should invest and participate in landscape-level research that explores water and forestry relationships, which can have multiple benefits for water supply reliability, water quality and ecosystems.” There is no known scientific controversy over the anticipated effects of the proposed activities on the quality of the human environment. The proposed meadow restoration would have a beneficial effect on the human environment by extending the season of summer base flow, enhancing aquatic and terrestrial habitat values, improving water quality, raising groundwater elevations and improving infiltration of precipitation. By restoring meadow ecosystem functional processes, the resilience of the channel/meadow system is increased and is less vulnerable to changes due to climate, natural disasters, and other disturbances.

5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

The Forest Service has considerable experience with actions like the one proposed. The analysis shows the effects are not uncertain, and do not involve unique or unknown risks. The proposed action is similar in type and scope to other meadow restoration projects in the Sequoia National Forest, and other national forests (and private lands) in the Sierra Nevada. Effects from this type of project are well known to the interdisciplinary team members.

6) The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

The Dry Meadow Restoration Project represents a site-specific project that does not set precedence for future actions with significant effects because no significant adverse effects have been identified for this project. Any additional work in the area would be analyzed in the future based on resource conditions at the time. The project does not represent a decision in principle about a future consideration. This EA is tiered to the Sequoia National Forest Land and Resource Management Plan (1988) as amended by the Sierra Nevada Forest Plan Amendment (2004) and is consistent with the Mediated Settlement Agreement (1990).

7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on

the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

A cumulative effect is the consequence on the environment that results from the incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions and regardless of land ownership on which the actions occur.

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and No Action alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects and is consistent with NEPA regulations (36 CFR 220.4(f)) (July 24, 2008) and California Environmental Quality Act regulations. Past anthropogenic disturbances within the project area include an old sawmill, grazing, construction of roads and culverts, and channelization of creeks. The project area is also subject to periodic, infrequent wildfires. All these past disturbances have contributed to the existing degraded condition versus pre-degradation conditions when stream channels flowed on the surface of the meadow floodplain. Overall project area disturbances and cumulative effects are discussed below under each resource heading.

Botanical Resources

Cumulative effects to plants may be a result of direct trampling, or uprooting, or indirectly, through soil erosion, compaction, a change in meadow hydrology, or invasion of non-native species. There are Forest Service roads near the project area. Roads and trails can alter hydrologic processes with ruts or culverts that cause head-cutting, resulting in a lower groundwater table. They can compact soils, and facilitate the introduction of invasive plant species, as well as native lodgepole pines, which encroach on meadows in a drying trend. The changes in plant communities that result from hydrologic changes can cause a decline in population numbers of some species, or complete extirpation from a site.

Together, current environmental conditions in the project area suggest that past human actions have adversely affected overall meadow/riparian health, meadow floodplain function, meadow/riparian vegetation, and altered the flora within the project area by introducing non-native plant species and altering potential habitat for native plant species. It is impossible to quantify losses and changes in biodiversity for the project area, but it is generally accepted that many plant communities in the Sierra Nevada are outside the historic range of variability due to human activities.

The project area is small in proportion to the range of all plants considered in this analysis. The Dry Meadow Restoration Project recognizes the impacts of past actions on overall wet meadow processes and functions and proposes restoration actions to place the meadow on a trajectory toward desired condition as described in the SQF LRMP and SNFPA ROD. It is expected that the Proposed Action would improve habitat for species dependent on the hydrologic function of wet/moist meadows.

There are reasonably foreseeable future management activities that will occur within the Dry Creek watershed. These projects include road maintenance, continuation of grazing, fuels reduction, thinning, timber harvest, prescribed burning, and hazard tree removal along roads and trails. Fire suppression activity would also occur in the event of another wildfire in the area. On all public lands managed by the US Forest Service, necessary protection measures would be used to prevent losses to sensitive plant species during the activities.

Adverse impacts to sensitive plants from recent activities have been minimized using mitigation measures, mainly through surveys and avoidance of sensitive species. It is anticipated that future impacts to sensitive plants would continue to be minimized through such actions. Therefore, the potential for adverse cumulative effects from proposed activities, past activities, and reasonably foreseeable actions is expected to be negligible for sensitive plants since adverse impacts to sensitive plants are regularly avoided during activities across the Sequoia NF.

Aquatic Wildlife

Cumulative effects to aquatic wildlife from other actions may be a result of habitat loss from erosion or sedimentation, a change in vegetation, or invasion of non-native aquatic species.

The roads and trails near the project area can alter hydrologic processes with ruts or culverts that cause head-cutting. The subsequent erosion degrades aquatic habitat with sedimentation and creates a loss of riparian vegetation that provides cover and shading. It is likely that higher quality aquatic habitat was more abundant historically within the meadow prior to the road and the sawmill. The sawmill operation excavated drainage ditches to dry the meadow out.

Past timber harvest activities in the watershed adjacent to streams and meadows had the potential to negatively affect aquatic habitats and species within, adjacent to, and downstream of the proposed project. Negative effects include sedimentation, loss of shading, and habitat fragmentation by creating impassable barriers to aquatic migration. However, in the past two decades, protective measures for streamside zones in timber

harvest areas have become more protective of riparian areas. Timber harvest on private land now also requires streamside buffers. Many of these past impacts to aquatic habitats persist on the landscape but continue to be addressed and corrected as on-going and future projects are developed. This project seeks to address some of the cumulative effects of these legacy impacts by restoring channel flow to the surface of the floodplain, rather than leaving it in the incised channels that were caused by ditching and head-cutting.

The primary current land use in Dry Meadow is cattle grazing. Grazing can destabilize stream banks by trampling and chiseling, thus creating wide, shallow channels that are more susceptible to warming insolation. Cattle trails in the meadow floodplain also have degraded meadow hydrology by creating compacted, bare linear features that capture overland flood flows, and start the erosion cycle. Current grazing management is less impactful, but legacy impacts still exist. Soils that are softened due to the restoration may be more susceptible to deep ruts from trailing. Improved riparian vegetation may encourage longer seasonal use by cattle within the larger grazing allotment. Grazing is monitored annually. The impacts of grazing on the restored meadow will be minimized by implementing management changes, in coordination with the permittee, as impacts are identified.

In addition to cumulative effects on habitats, the introduction of non-native species has adversely affected several aquatic species throughout the Sierra Nevada. However, there are natural barriers to fish passage below Dry Meadow, and no non-native aquatic species are known to occur in the Dry Meadow project area.

The level of recreation use on all National Forest System lands is expected to continue and increase with human population numbers. Current management prohibits off-highway vehicles in meadows, however, there are no physical barriers, and one trip of an off-highway vehicle in soft meadow soils can create lasting ruts. Fishing may transfer diseases from one watershed to another. Recreational visitor education can help increase awareness of these potential impacts to reduce their negative effects, however, these recreation-related impacts will continue to occur.

The effects of acid precipitation, ultraviolet radiation, viruses, Chytrid fungus, pesticides, habitat destruction, predation, global climate change, and synergistic interactions among these factors have all been suggested as causes for the worldwide decline of amphibians and native fish populations. Increased isolation of threatened frog and fish populations may also reduce the probability of re-colonization. This effect could occur due to the decreased size of potential source populations, the increased distance from source populations, and direct predation on dispersing individuals. Decreased snow pack and

winter warming can change the period of peak water and change the later summer flows. This has the potential to convert perennial streams into intermittent streams thus eliminating or reducing suitable aquatic breeding habitat. In addition, warming water may make the habitat unsuitable for tadpoles and other aquatic life by late summer. This project, by improving the shallow groundwater storage, would help keep water cooler and flowing longer into the year. Once riparian plantings mature, they would provide shade to help mitigate for warming temperatures. Thereby, this project would improve the resilience of these headwater meadows to cumulative effects of climate change.

Terrestrial Wildlife

Cumulative effects to terrestrial wildlife of non-native species, climate change, and grazing are like those described under Aquatic Wildlife. In addition, timber harvest activities adjacent to the meadow have the potential to significantly affect the forest edge habitat that many species prefer. Roads and trails in the project area have had adverse effects on terrestrial species habitat through fragmentation and human disturbances. Past habitat conditions may have been more desirable for the little willow flycatcher and great gray owl in the meadow, but channel erosion and incision have lowered the groundwater elevation, resulting in less wet meadow vegetative cover and fewer riparian shrubs (i.e. willows and alders) that create desirable habitat complexity. Over the last twenty years, protective measures for snags, forest canopy closures, and streamside zones in timber harvests on public and private lands areas have become more protective of old growth forests and riparian areas. However, recent wildfires have severely diminished the quality of forested landscapes around Dry Meadow.

The expected increase in recreational use on all National Forest System lands is expected to affect terrestrial wildlife species and their habitats due to compaction of soils, removal of vegetation, alterations in the streambank- riparian-floodplain-upland vegetation continuum, and direct human-induced disturbances. Overall improvement of the meadow ecosystem and habitat complexity under this project would provide improved overall habitat resilience for these species.

In addition to habitat changes in and near the project area, population declines in songbirds are often attributed to regional habitat loss and fragmentation caused by land-use practices, which may be further aggravated by climate change (Mathewson et al. 2012). These are of concern where riparian areas are considered a priority for conservation because of predicted reductions in winter precipitation and increases in spring temperatures. These climatic changes might increase the susceptibility to regional extirpation from loss of habitat for species reliant on riparian areas. Due to climate-induced potential shortening of time when wet habitat conditions are available in the Sierra Nevada, lower reproductive success for willow flycatchers could add to population

declines (Mathewson et al. 2012). Restoring the hydrologic function of meadows may provide some resilience to the effects of climate change on willow flycatcher habitat, by maintaining water in the meadow longer into the season. This would have a similar effect for habitat for great gray owl prey.

Hydrologic and Soil Resources

This proposal would affect a meadow ecosystem and would not create any additional impervious surfaces such as roads. Therefore, a cumulative watershed effects analysis was not conducted for this proposal. This cumulative effect analysis considers restoration activities such as mechanical equipment and streambed alteration. Previous restoration attempts in the meadow include channel reconstruction and headcut treatments. The channel reconstruction was effective, and that area would not be treated again under this Proposed Action, because it is in functional condition. The headcut treatments were not successful and are included in the Proposed Action as part of the pond-and-plug treatment. The main headcut on the Tobias Fork is threatening the functional reach that was previously treated with channel reconstruction. The Proposed Action would eliminate the headcut and protect this earlier work.

The mechanical equipment work and streambed alteration disturbances in the Proposed Action have the potential to increase sediment transport, soil compaction, and to negatively affect water quality. However, these disturbances would be short term and greatly minimized by using Best Management Practices. The long term cumulative effects are expected to be beneficial, and include reducing sedimentation back to natural levels, restoring Dry Meadow's hydrologic function and connectivity to its floodplain, and improving riparian and aquatic habitats. The Cumulative Watershed Effects (CWE) Threshold of Concern (TOC) and Equivalent Roaded Acre (ERA) values would not change from existing condition, as the project entails no additional roads, and would restore temporary access routes to pre-project conditions. Channel/floodplain re-connection and invigorated riparian vegetation are expected to improve infiltration into the floodplain aquifer. The expected overall impact to the subwatershed would be a subtle shift back to a more stable and natural hydrologic function. As a result there would be no measurable negative cumulative effects from implementing the Dry Meadow Restoration Project proposed action.

8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

This project complies with Section 106 of the National Historic Preservation Act of 1966, as amended in accordance with provisions of the Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State

Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region (Regional PA 2013). The proposed action would have no adverse effect to cultural resources. The project has the potential to maintain the integrity of the pre-degradation historic setting and stabilize unknown surface and subsurface deposits of cultural resources, thus resulting in potential beneficial indirect effects.

9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

There are no federally, or state listed endangered or threatened wildlife or plant species or critical habitats within the project area. There are two federally listed endangered wildlife species with potential suitable habitat known to occur in or near the project area: the California condor and the mountain yellow-legged frog. The Pacific fisher is being considered for federal listing. They are known to occur near the project area.

California condor habitat is known to occur within 30 miles of the project area. There are no critical habitats designated within the project area for this species, nor have California condors ever been documented in the project area. Currently, no condor roosting, or nesting sites occur near the project. Potential suitable habitat occurs near the project area but would not be adversely affected by the proposed action. Based on tracking data of California condors and lack of use in the project area, there would not be any adverse effects on the condor or its habitat from the Proposed Action.

The Pacific fisher has been detected during surveys near the project area, however, this species does not occupy meadow habitats, so there would be no adverse effects on the fisher or its habitat from the Proposed Action.

There is suitable (“utilization unknown”) habitat for the mountain yellow-legged frog (*Rana muscosa*) within Bull Run Basin nearby. The meadow itself has such damage that it currently does not contain suitable habitat. Beneficial and negative impacts to this species are discussed in detail under FONSI element 1. It is extremely unlikely that any MYLF would be present in the project area. The closest known population is over twenty air miles to the north, with stocked trout populations in the Kern River in between the known MYLF locations and Dry Meadow.

On April 24, 2014, the U.S. Fish and Wildlife Service published the final rule to list the mountain yellow-legged frog (*Rana muscosa*, Northern Distinct Population Segment (NDPS)) as an endangered species, under the Endangered Species Act, effective June 30,

2014. Of the three amphibian species listed in that ruling, only the mountain yellow-legged frog (*Rana muscosa* NDPS) has the potential to occur within the project area. Proposed critical habitat has also been identified for this species (Federal Register: Vol. 78 No. 80, April 25, 2013). No critical habitat occur within the project area.

Status of the Species: A number of researchers have reported disappearances of the MYLF from significant portions of its historic range. It is imperiled from a number of factors, especially invasive trout, chytrid fungus, and global climate change.

Effects of the Action (watershed restoration): The Dry Meadow Restoration Project has been designed to implement all the Conservation Measures and Terms and Conditions described in the Programmatic Biological Opinion as well as design criteria developed for the project. . By implementing these BMPs, mitigation measures/design criteria, and Conservation Measures and Terms and Conditions, the project would have no effect on MYLF.

Cumulative Effects: MYLF is subject to the following cumulative effects: introduced trout, chytrid fungus, and climate change. The mechanisms of these effects are discussed in the length in the BO, incorporated by reference.

Beneficial effects from the proposed action would be long-term by improving and increasing acreage of wet meadow habitat through restoration of hydrologic functions. The project would provide additional connectivity of habitat by lengthening the period when the meadows is wet, and providing extended base flows resulting in long-term beneficial effects on the species.

10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

Alternative 1 (Proposed Action) and Alternative 2 (No Action) were developed in accordance with, and therefore do not threaten to violate any, Federal, State and local laws, and requirements for protection of the environment. The Proposed Action and No Action Alternative are consistent with the NEPA, Endangered Species Act (ESA), National Historic Preservation Act (NHPA), Clean Water Act, Clean Air Act, National Forest Management Act (NFMA), and California Environmental Quality Act (CEQA). The action alternative is also consistent with the Sequoia National Forest Land and Resources Management Plan (1988), as amended by the Sierra Nevada Forest Plan Amendment (2004). I is consistent with the Mediated Settlement Agreement (1990).

Additional Analysis Required for CEQA

In addition to the analysis covered above in this document, the California Environmental Quality Act (CEQA) requires that the following topics are also addressed in the environmental review for a proposed project: air quality, geology, and greenhouse gas emissions. A list of mitigations is also required under CEQA. The mitigations for this project are listed by resource under the Design Criteria section of this document.

County: Tulare

General Plan designation: Ag Preserve

Zoning: The project area is zoned as A-1. The proposed work would not change the zoning, nor primary land uses.

Other permits required: This is a National Forest Project proposed on National Forest System lands. As such, no Streambed Alteration Agreement (California Resources Code §1600 permit) is required from the California Department of Fish & Wildlife. The project is subject to the Clean Water Act (CWA). As such, a CWA§404 permit is required from the Army Corps of Engineers, and a CWA§401 permit is required from the Regional Water Quality Control Board (RWQCB). Both permits will be acquired before project implementation. The RWQCB permit may also require a Stormwater Pollution Prevention Plan (SWPPP). No other permits are required.

Air quality

The project area is located on National Forest System lands in the San Joaquin Valley Air Basin, which is designated as a “nonattainment area” for ozone and PM10 under California ambient air quality standards. The proposed project would have no long-term impacts to air quality. However, the project includes excavation and grading activities to fill the incised channel. Construction activities have the potential to affect PM10 and ozone concentrations through exhaust emissions, and the generation of fugitive dust from soil-disturbing activities. Mitigations to minimize dust (i.e. watering roads and fill as it is placed) would protect air quality during construction. After construction, bare areas would be mulched and seeded to minimize the potential for blowing dust. In the short term, there may be objectionable odors from the normal operation of heavy equipment diesel engines during construction. In the long term, there would be no objectionable odors.

Geology

The Division of Mines and Geology Special Publication 42 was consulted. The project area is not within an earthquake fault zone.

Greenhouse Gas Emissions

Environmental Setting

The project is in a natural setting in the Sequoia National Forest. On-going greenhouse gas (GHG) emissions in this area are from normal ecosystem function. Intermittent sources of greenhouse gas emissions occur from dispersed recreation, forest management activities, and wildfire.

The project area is a meadow ecosystem in a degraded state, with incised (downcut) channels that have resulted in a loss of floodplain connectivity and drying of the meadow. Carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄) are GHGs associated with meadows, and fluxes in the emission of these GHGs can be dependent on soil moisture content (Blankinship and Hart 2014). Functional meadows are net reservoirs for greenhouse gases; however, there are a number of active research projects across the state that are attempting to quantify the net flux of GHGs in restored and degraded meadows. Currently, there is a statewide effort to restore wetlands and mountain meadows as a climate change adaptation strategy. The strategy includes quantitative research on GHG fluxes (CDFW 2017).

Impact Discussion

The proposed project would restore the hydrologic function of Dry Meadow, which is expected to provide a long-term reduction in GHG emissions from the project area. Construction of the project would create a short negative impact with one-time GHG emissions by on-site heavy equipment and travel to the work site during the six-week construction period. The GHGs emitted during construction would come from diesel fuel combustion from off-road construction equipment and diesel or gasoline combustion from on-road vehicles. The primary GHG generated from these processes would be carbon dioxide (CO₂), with smaller amounts of emissions of methane (CH₄) and nitrous oxide (N₂O). Construction emissions would permanently cease at the end of project construction. Over the long-term, these temporary emissions would be offset by the restoration of meadow hydrology and re-establishment of meadow vegetation. Thus, while the project would have an incremental, short-term, and one-time contribution to GHG emissions within the context of the county and region, the individual impact is considered less than significant. The proposed project would not conflict with an applicable plan, policy, or regulation adopted to reduce the emissions of greenhouse gases.

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